

## A review of the *Deudorix repercutsa* (LEECH, 1890) group from China

(Lycaenidae, Theclinae)

by

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**Abstract:** The *Deudorix repercutsa* (LEECH, 1890) group from China is reviewed, with the following new taxa described: *D. dengi* H. HUANG, ZHU & LI **spec. nov.** from Chongqing, Fujian, Zhejiang and Guangxi, and *D. sylvana irwini* H. HUANG & ZHU **subspec. nov.** from Shaanxi, Chongqing, Hubei and Zhejiang. The following taxonomic changes are given: *D. rapaloides pseudorapaloides* WANG & CHOU, 1996 **stat. nov.** (= *D. pseudorapaloides* WANG & CHOU, 1996), *Deudorix nanlingensis* WANG & FAN, 2002 **syn. nov.** (= *D. rapaloides pseudorapaloides* WANG & CHOU, 1996), *D. sankakuhonis* (MATSUMURA, 1938) **stat. rev.**, and *D. sankakuhonis hainana* CHOU & GU, 1994 **stat. nov.** (= *D. hainana* CHOU & GU, 1994).

**Introduction:** The species discussed in this paper belong to a small species group of the genus *Deudorix* HEWITSON, [1863], at best called the *Deudorix repercutsa* (LEECH, 1890) group, defined by the following combination of characters: 1) hindwing upperside of ♂ with an androconial patch (♂ brand) at base of spaces 6-7; 2) forewing underside of ♂ with a seta tuft near dorsum of forewing; 3) underside of both wings marked as in *Rapala* MOORE, 1881, sometimes with discal bands wider than usual; 4) hindwing underside without any subbasal spots or markings; 5) tegumen of ♂ genitalia in lateral view robust, combined with socii into a rather square structure; 6) tegumen in dorsal view with a rather long midline; 7) valvae very slender near apex in both ventral and lateral views; 8) aedeagus with a pair of lateral carinae aedeagi at apex; 9) cornuti of aedeagus large in number and closely assembled.

This species group was placed by some authors (OSADA & al., 1999; SEKI & SAITO, 2006) under the genus *Virachola* MOORE, 1881 (type species: *Deudorix perse* (HEWITSON, [1862])), on account of the presence of a ♂ brand on hindwing upperside. However, the species of this group are very similar to *D. epijarbas* (MOORE, 1857) (type species of *Deudorix* HEWITSON, [1863]) in external features and genital structures, with the only difference found in the presence of a ♂ brand. Further on, there is no significant difference in larval morphology between *D. epijarbas* (MOORE) and *D. rapaloides* (NARITOMI, 1941) (IGARASHI & FUKUDA, 1997, 2000; HSU, 2013; LV & CHEN, 2014). A comprehensive discussion on the generic classifications involving *Virachola* MOORE and *Deudorix* HEWITSON is out of our scope in this paper. Nevertheless, to treat the *Deudorix repercutsa* (LEECH) group as belonging to *Virachola* MOORE will result in that the division between *Virachola* MOORE and *Deudorix* HEWITSON is solely based on the presence or absence of a ♂ brand.

### Abbreviations:

BSNU: Biological laboratory of Shanghai Normal University, Shanghai, P.R. China.

CCZB: Collection of ZHI-BING CHEN.

CHH: Collection of HAO HUANG.

CHSY: Collection of SI-YAO HUANG.

CLP: Collection of PENG LI.

CLYF: Collection of YU-FEI LI.

CLZH: Collection of ZI-HAO LIU.

CMWW: Collection of WEI-WEI MAO.

CWCH: Collection of CHUN-HAO WANG.

CZJQ: Collection of JIAN-QING ZHU.

CZLP: Collection of LI-PING ZHOU.

HT: Holotype.

LT: Lectotype.

PLT: Paralectotype.

PT: Paratype.

RITF: Research Institute of Tropical Forestry, Chinese Academy of Forestry, Guangzhou.

ST: Syntype.

TL: Type locality.

**Species boundary and useful characters:** Nine valid taxa from China and further three taxa from Vietnam, Myanmar and northeastern India (*Rapala refulgens* NICÉVILLE, 1891, *Virachola dohertyi* TYTLER, 1915, *Virachola superbiens* SAITO & SEKI, 2006) were recognized as members of this species group, including two new taxa. It is necessary to discuss how to give a reasonable specific classification for all these taxa.

1. The sympatric taxa are considered as different species because of the apparent reproductive isolation. And the following sympatric facts are known:

- 1) Fengxian, Shaanxi: *D. sylvana irwini* H. HUANG & ZHU **subspec. nov.**, *D. repercussa* (LEECH).
- 2) Simianshan, Chongqing: *D. dengi* H. HUANG, ZHU & LI **spec. nov.**, *D. sankakuhonis hainana* CHOU & GU.
- 3) Tianmushan, northern Zhejiang: *D. sankakuhonis hainana* CHOU & GU, *D. rapaloides kameyamai* (SUGIYAMA), *D. sylvana irwini* H. HUANG & ZHU **subspec. nov.**
- 4) Baishanzu, southern Zhejiang: *D. sankakuhonis hainana* CHOU & GU, *D. sylvana irwini* H. HUANG & ZHU **subspec. nov.**, *D. rapaloides kameyamai* (SUGIYAMA), *D. dengi* H. HUANG, ZHU & LI **spec. nov.**
- 5) Guadun, Wuyishan, northern Fujian: *D. sankakuhonis hainana* CHOU & GU, *D. dengi* H. HUANG, ZHU & LI **spec. nov.**
- 6) Nanling, northern Guangdong: *D. sankakuhonis hainana* CHOU & GU, *D. rapaloides pseudorapaloides* WANG & CHOU.

The comparison between these sympatric taxa and a survey of individual variations suggest that the following characters (fig. 1) are useful in separating species of the *Deudorix repercussa* (LEECH) group. Some of them may be variable within certain species but can be useful in separating the others.

- A) ♂ brand on hindwing upperside: not associated distally with any white patch (A-1); associated distally with a larger white patch in both spaces 6 and 7 (A-2); associated distally with a smaller white patch mostly in space 7 but hardly in space 6 (A-3).
- B) Discal band on forewing underside in both sexes: placed in a line or a smooth curve (B-1); shifted at vein 4 (B-2).
- C) Seta tufts near dorsum on forewing underside in ♂: pale brown (C-1); dark brown (C-2).
- D) Costae of valvae in ♂ genitalia: visible in ventral view and well exposed from the outer margins of valvae (D-1); invisible in ventral view and entirely covered by valvae (D-2).
- E) Basal margin of valvae: with a medial depression (E-1); smoothly rounded at middle (E-2).
- F) Valvae in ventral view with their widest point: nearly at middle (F-1); markedly closer to bases of valvae than to apices of valvae (F-2).
- G) Distal branches of valvae: nearly as long as ampulla (G-1); markedly shorter than ampulla (G-2). (= Central split of valvae: nearly reaching the base of ampulla (G-1); far from reaching the base of ampulla (G-2).)
2. Though the allopatric *D. sankakuhonis hainana* CHOU & GU and *D. repercussa* (LEECH) share many external and genital characters, they are supposed to be different species by their differences in the ground color on both wings upperside of ♂, the length of the tail in both sexes, the size of the eye-spot on the hindwing underside in both sexes and the following genital character.
- H) Carinae aedoeagi: fully developed (H-1); obsolete and only traceable (H-2).

**Characters individually variable within most species:** The following characters are generally considered as not important in separating species, as they are individually variable within most species of the *Deudorix repercussa* (LEECH) group.

- 1) Features of carinae aedoeagi (shape, size, number of teeth, etc.). These characters are variable within the same populations of *D. rapaloides kameyamai* (SUGIYAMA), *D. rapaloides pseudorapaloides* WANG & CHOU and *D. sylvana irwini* H. HUANG & ZHU **subspec. nov.**
- 2) Lateral projections at central part of aedoeagus: fully developed; obsolete and only traceable. This character is variable among the type specimens of *D. dengi* H. HUANG, ZHU & LI **spec. nov.**
- 3) Size of the normal cornutus (not the most caudal one) and number of cornuti. These characters are individually variable within *D. sankakuhonis hainana* CHOU & GU, *Deudorix sylvana sylvana* OBERTHÜR, 1914, *D. sylvana irwini* H. HUANG & ZHU **subspec. nov.** and *D. dengi* H. HUANG, ZHU & LI **spec. nov.** It should be noted that *D. rapaloides pseudorapaloides* WANG & CHOU, 1996 **stat. nov.** shares most of the genital characters with the other two subspecies, except only for the size of the normal cornutus. Such difference in size of the normal cornutus can not be used solely as an important character to separate *D. rapaloides pseudorapaloides* WANG & CHOU, 1996 **stat. nov.** from *D. rapaloides* (NARITOMI, 1941) in specific level, because this character is individually variable in most of the other species of the *Deudorix repercussa* (LEECH) group.
- 4) Features (shape, length, width, etc.) of first cornutus (the most caudal cornutus when vesica not everted).
- 5) Features of apex of valva (shape, length, etc.).
- 6) Length, width and the length-width ratio of valvae in ventral view. The lateral sides of the valvae are twistable so that the width of the valvae observed can be variable.
- 7) Detailed shape of lateral margins of valvae in ventral view. The lateral sides of valvae are twistable so that the lateral margins of valvae observed can be variable in shape.
- 8) Length of distal branches of valvae (= length of central split of valvae), and the ratio of such length to the length of the valvae.

#### Taxonomic accounts for Chinese taxa

##### *Deudorix repercussa* (LEECH, 1890) (figs. 2-7, 51-52)

*Rapala repercussa* LEECH, 1890, The Entomologist **23**: 42, TL: Changyang (Hubei); LEECH, [1893]: 414, pl. 29, fig. 10 for ♂, fig. 13 for ♀; SOUTH, 1902: 154, catalogue of specimens; SEITZ, 1909: 259, figs. 72a for ♂ and ♀.

*Rapala repercussa* ab. *nebulifer* SEITZ, 1909: 259. Infrasubspecific.

*Deudorix repercussa*: SHIRÔZU & UEDA, 1992: 137.

**Material:** Hubei Province: LT ♂ (Fig. 2) of *Rapala repercuta* LEECH (BMNH), here designated, labelled: /Chang Yang//A. E. PRATT Coll./July 1888; type/male//LEECH; LEECH Coll./1901-173//„*Deudorix repercuta*“//„f“/; BMNH (E) #720392; LT designated by H. HUANG. PLT ♀ (Fig. 4) of *Rapala repercuta* LEECH (BMNH), labelled: /Chang Yang//A.E. PRATT Coll./July 1888; type/female//LEECH; LEECH Coll./1901-173//„*Deudorix repercuta*“//„g“/; BMNH (E) #720393; PLT designated by H. HUANG. Shaanxi Province: 1 ♂ (CZLP), Fengxian County, Dongheqiao Village, Shen-sha-he, 1400-1600 m, 9.VIII.2010, L.-P. ZHOU leg.; 1 ♂ (CZLP), Fengxian County, Dongheqiao, 1500-1650 m, 23.VII.2009, L.-P. ZHOU leg.; 1 ♀ (CWCH), Fengxian County, 1550 m, 16.VII.2010, C.-H. WANG leg.. Gansu Province: 1 ♂ (CHSY), Kangxian County, Qinghelinchang, 1300 m, 18.VII.2014, S.-Y. HUANG leg.

**Identification:** LEECH (1890) mentioned 10 ♂♂ and 2 ♀♀ from Chang Yang, Hubei in original description. SOUTH (1902) located 6 ♂♂ and 1 ♀ from Chang-yang and 1 ♀ from Omeishan in LEECH's collection; he clearly marked specimens „f“ and „g“ as „Type“, probably in sense of the concepts of HT and AT. A LT designation is made herein and there is no option but to select specimen „f“ as LT, because this specimen fits the original description and agrees with the figure subsequently published by LEECH ([1893]). The LT possesses the above-mentioned characters A-1 and B-2 (see under the species boundary and useful characters heading). 3 ♂♂ from Shaanxi and Gansu were examined with two of them dissected; they agree with the LT in most of the wing characters, except the detailed shape of discal band in spaces 1b-3 on hindwing underside. The ♀ PLT from Hubei and 1 ♀ from Shaanxi were associated with the ♂♂, based on the collecting data and their similarity in ground color and wing-patterns on the underside, especially the shifted forewing band.

**Diagnostic characters:** This species possesses characters A-1, B-2, C-2, D-1, E-1, F-1, G-2, and H-1 (see under the Species boundary and useful characters heading). It is more similar to *D. sankakuhonis* (MATSUMURA) than to other species, but *D. repercuta* (LEECH) differs from the latter by having the constantly shorter tails in both sexes, the iridescent blue color on both wings upperside of ♂, and the markedly larger carinae aedoeagi (character H-1).

**Remarks:** The period of emergence was recorded from late July to early August, whilst the sympatric *D. sylvana irwini* H. HUANG & ZHU **subspec. nov.** was found flying from late June to mid July.

**Distribution:** Hubei, Shaanxi, Gansu, Sichuan.

#### *Deudorix sylvana sylvana* OBERTHÜR, 1914 (figs. 18-22, 61-62)

Et. lep. comp. 9: 54, pl. 255, fig. 2154 for ♂, TL: Tse-kou (Cizhong, NW Yunnan); GAEDE, 1930: 239, pl. 15-a for ♂. *Rapala repercuta sylvana*: D'ABRERA, 1993: 429, partim on figs. of ♂ from Tsekou only.

**Material:** Yunnan Province: 1 ♂ (CHH), Diqing Tibetan Autonomous Prefecture, Weixi County, Xiaoweixi Village, 1500 m, 9.VI.2004, H. HUANG leg.; 3 ♂♂ (CHH), Diqing, Deqin County, Cizhong Village, 1800 m, 13.-14.VII.2004, H. HUANG leg.; 2 ♂♂ (CHH), Nujiang Prefecture, Gongshan County, Qiqi Station, 2107 m, 4.VII.2010, X.-D. YANG leg.

**Identification:** 3 ♂♂ collected from the TL, Tsekou (Cizhong), NW Yunnan show no difference in wing-pattern from the ST ♂ originally figured in OBERTHÜR (1914, pl. 255, fig. 2154). The 3 ♂♂ from the nearby Xiaoweixi and the Nujiang valley were identified being this taxon, based on wing-patterns and genital characters. Specimens from outside Yunnan have all genital characters equal with those of the specimens from Yunnan; they were identified as belonging to the same species. However, the specimens from outside Yunnan, usually lack the reddish patch on forewing upperside and the bluish patch basal to the eyespot in space 2 on hindwing underside. Thus a new subspecies is described below for these specimens.

**Specific characters:** This species possesses characters A-1, B-1, C-2, D-2, E-2, F-1, G-2, and H-1 (see under the species boundary and useful characters heading). Moreover, it usually has all discal bands on both wings underside wider than in all other species of the group.

**Distribution:** NW Yunnan.

#### *Deudorix sylvana irwini* H. HUANG & ZHU **subspec. nov.** (figs. 23-26, 46-50, 63-65)

*Rapala repercuta*: WANG, NIU & CHEN, 1998: pl. 81, figs. 13-14 for ♂ from Henan; WANG & FAN, 2002, cp. 16, figs. 14-15 for ♂ from Henan. Misidentification.

HT ♂ (fig. 25, BSNU): China, Shaanxi Province, Ningshaan County, Guanghuojie, 1300 m, 16.VII.2011, Y.-F. LI leg.. PTs (31 ♂♂, 4 ♀♀ in total): Shaanxi Province: 1 ♂ (CLYF), Ningshaan, Guanghuojie, 1300 m, 4.VII.2004, Y.-F. LI leg.; 7 ♂♂ (CLYF), Ningshaan, Xunyangba, 1300-1600 m, 22.VII.1999, 25.VI.2006, 20.VI.2014, 15.VII.2014, Y.-F. LI leg.; 1 ♂ (CZLP), Hanzhong City, Liuba, Liuhou, 1400-1700 m, 11.VII.2015, LI-PING ZHOU leg.; 2 ♂♂ (CHSY), Hanzhong, Liping Nature Reserve, 1500 m, 12.VII.2015, S.-Y. HUANG leg.; 1 ♂ (CZLP), Baoji City, Fengxian, Huangniupu, 1500-1700 m, 28.VI.2012, LI-PING ZHOU leg.; 2 ♂♂, 1 ♀ (CZLP), Baoji, Fengxian, Dongheqiao, 1500-1600 m, 7.VII.2009, LI-PING ZHOU leg.; 1 ♀ (CHH), Baoji, Fengxian, 1500-1700 m, 12.VII.2014, S.-H. HUANG leg.; 4 ♂♂, 1 ♀ (CLP), Baoji, Fengxian, 1500-1700 m, VII.2015, P. LI leg.; 1 ♂ (CWCH), Baoji, Fengxian, 1600m, 5.VII.2009, C.-H. WANG leg.; 2 ♂♂ (CLYF), Baoji, Fengxian, 1600-1700 m, 5.VII.2007, 12.VII.2015, Y.-F. LI leg.; 1 ♂ (CLYF), Ankang City, Langao County, Zhang-

he, 1500 m, 5.VII.2014, Y.-F. LI leg.; 5 ♂♂ (CWCH, CLYF), Xi-an City, Zhouzhi, Houzhenzi, 1200 m, 27.VI.2009, C.-H. WANG & Y.-F. LI leg.. Chongqing: 1 ♂ (CHH), Wushan County, Liziping, 2000 m, 3.VII.1993, J. YAO leg.. Zhejiang Province: 1 ♂ (CCZB), Lin-an City, West Tianmushan, 600m, 17.VII.2010, Z.-B. CHEN leg.; 1 ♂ (CMWW), Lin-an City, West Tianmushan, 500-800 m, 28.VI.2012, W.-W. MAO leg.; 1 ♀ (CHH), Lin-an, West Tianmushan, 1000 m, 10.VII.2008, H. HUANG leg.; 1 ♂ (CZJQ), Lishui City, Qingyuan County, Baishanzu, 1500 m, 21.VII.2007, J.-Q. ZHU leg..

**Specific characters:** This new taxon possesses characters A-1, B-1, C-2, D-2, E-2, F-1, G-2, and H-1 (see under the species boundary and useful characters heading).

**Subspecific characters:** This new subspecies can be distinguished from the nominotypical one by the following combination of ♂ characters: 1) forewing upperside usually with no reddish patch; 2) hindwing underside usually with less prominent bluish streak basal to submarginal markings in spaces 1b-2. Of the 32 ♂♂ specimens examined, only two bear reddish scales on forewing upperside.

**Remarks:** As stated before, this new taxon is sympatric with *Rapala reperculsa* LEECH, but with an earlier flight period.

**Etymology:** This new subspecies is named in honor of Dr. RICHARD IRWIN VANE-WRIGHT (University of Kent, Canterbury, UK), for his generous help to the senior author.

**Distribution:** Shaanxi, Chongqing, Hubei (photo of an adult taken from Shennongjia examined), Henan, Zhejiang.

***Deudorix sankakuhonis sankakuhonis* (MATSUMURA, 1938) stat. rev. (Fig. 58)**

*Rapala sankakuhonis* MATSUMURA, 1938, Insecta matsumurana **12**: 107; TL: Taiwan.

*Deudorix sankakuhonis* SHIRÔZU, 1960: 307, fig. 340 for ♂ genitalia, pl. 66, figs. 701-702 for ♂.

*Deudorix reperculsa sankakuhonis*, SHIRÔZU & UEDA, 1992: 137; HSU, 2013: 134, figs. for ♂ and ♀.

**Material:** None.

**Specific characters:** This species possesses characters A-1, B-2, C-2, D-1, E-1, F-2, G-2, and H-2 (see under the species boundary and useful characters heading). Moreover, the species usually has longer tail of hindwing and narrower discal bands on both wings underside than in all other species of the group. The species is more similar to *D. reperculsa* (LEECH) than to all others, with the differences restricted to the duller ground color on the wings upperside, the longer tail of the hindwing, and the thinner carinae penis of the aedeagus in the ♂ genitalia.

**Subspecific characters:** The nominotypical subspecies is restricted to Taiwan. It differs from *D. sankakuhonis hainana* CHOU & GU stat. nov. from the Chinese continent and Hainan Island by having the both wings underside ground color more grayish and less reddish and the discal bands on the hindwing underside closer to the discocellular bar.

**Distribution:** Taiwan.

***Deudorix sankakuhonis hainana* CHOU & GU stat. nov. (Figs. 8-17, 53-57, 59-60)**

*Rapala* sp., TONG, QIAN & WANG, 1993: 60, pl. 55, figs. 560-561 for ♀ from Taishun, Zhejiang.

*Deudorix hainana* CHOU & GU, in CHOU et. al., 1994: 652, figs. for ♂ HT from Hainan, 770, description; GU & CHEN, 1997: 271, partim on figs. 359-♀ (actually HT ♂) from Hainan.

*Deudorix pseudorapaloides*: JIANG et. al., 2001: 115, pl. 121, figs. 26-375 for ♂ and ♀ from Fuzhou and Shunchang, Fujian; WANG & FAN, 2002: cp. 14, figs. 19-22 for ♂♂ from Guangdong. Misidentification.

**Material:** Hainan Province: HT ♂ (Fig. 8, RITF), photos, Jianfengling Nature Reserve, Tianchi, 19.VII.1987, M.-B. GU leg.. Zhejiang Province: 2 ♂♂, 1 ♀ (CHH), Lin-an City, West Tianmushan, 1000 m 23.-29.VI.2008, H. HUANG leg.; 1 ♂ (CZJQ), Lin-an City, Qingliangfeng, 1000 m, 9.VIII.2011, J.-Q. ZHU leg.; 1 ♂ (CZJQ), Lishui City, Qingyuan, Baishanzu, 1000-1300 m, 20-25.VII.2008, L. NING leg.; Anhui Province: 1 ♂ (CLZH), Huangshan City, Fuxi, ca. 1000 m, 7.VII.2013, Z.-H. LIU leg.; Fujian Province: 1 ♂, 1 ♀ (CHH), Fuzhou City, Shoushan, 1000 m, VII.2007, M. LI leg.; 1 ♀ (CHH), Wuyishan, Guadun, 1200 m, 29.VIII.2009, H. HUANG leg.; Guangdong Province: 1 ♂ (CZJQ), Shaoguan City, Ruyuan, Nanling Nature Reserve, 600 m, 10.VII.2009, J.-Q. WANG leg. Chongqing: 1 ♂ (CZJQ), Jiangjin County, Simianshan Nature Reserve, Chaqishan, 1500-2000 m, 24.VII.2009, A.-M. LI leg.

**Identification:** In the photos (fig. 8) the HT bears a small iridescent blue patch in discal area of the space 1b on the upperside of the left forewing, but has no such iridescent patch on the right forewing. These photos (fig. 8) were taken under a flow of strong light from the left, not under the soft light as in all other photos published in this work. And the same iridescent patch was observed also on the wings of the ♂ collected from Fuzhou (fig. 9) under the oblique strong light. The ♂ specimen from Fuzhou (fig. 9) agrees with the HT (fig. 8) in all of the wing characters. However, such iridescent blue patch under the oblique strong light has not been found from the fresh specimens collected from Zhejiang. Nevertheless, an examination of ♂ genitalia proves that all these specimens from the continent share all of the important genital characters so that they belong to the same species. No other difference has been found between the populations from Hainan and Fuzhou and those from Zhejiang. All specimens examined show a dull and dark ground color on both wings upperside under soft light.



**Specific characters:** As in the nominotypical subspecies from Taiwan, this taxon possesses characters A-1, B-2, C-2, D-1, E-1&2, F-1&2, G-2, and H-2 (see under the species boundary and useful characters heading) and a markedly longer tail of hindwing than in *D. reperculsa* LEECH.

**Subspecific characters:** This subspecies differs from the nominotypical one from Taiwan by having the ground color on both wings underside redder and brighter and the discal bands on hindwing underside remoter from the discocellular bar.

**Remarks:** There is no transitional form found between *D. sankakuhonis hainana* CHOU & GU and *D. reperculsa* LEECH. The differences in length of the tail, ground color of the wings upperside and size of the carinae aedoeagi are constant throughout all of the populations. Therefore, it is reasonable to treat these two taxa as different species.

**Distribution:** Hainan, Guangdong, Fujian, Zhejiang, Anhui, Chongqing.

*Deudorix rapaloides rapaloides* (NARITOMI, 1941) (fig. 80)

*Thecla rapaloides* NARITOMI, 1941, Entomological world 9 (91): 619, pl. 4, fig. 5; TL: Taiwan.

*Virachola ferrea* ARAKI, 1949: 17; SHIRÔZU, 1960: 301, synonymy for *Deudorix rapaloides*.

*Deudorix rapaloides*: SHIRÔZU, 1960: 302, fig. 335 for ♂ genitalia, pl. 65, figs. 679-682 for ♂ and ♀; BRIDGES, 1988: 30; SHIRÔZU & UEDA, 1992: 137; HSU, 2013: 136, figs. for ♂ and ♀; LV & CHEN, 2014: 252-253, figs. for early stages.

*Virachola rapaloides*, IGARASHI & FUKUDA, 2000: 584, pl. 289, food plants, habits and morphological notes, figs. for ♂, ♀ and early stages.

**Material:** None.

**Specific characters:** This species possesses characters A-3, B-1&2, C-1, D-2, E-1, F-2, G-2, and H-1 (see under the species boundary and useful characters heading).

**Subspecific characters:** This subspecies can be distinguished from the other two ones from the mainland in both sexes by having the discal band on the forewing underside contracted towards the dorsum of the forewing.

**Remarks:** The genital characters of this taxon were read from SHIRÔZU's (1960) illustration. There is no difference in ♂ genitalia between the nominotypical subspecies from Taiwan and *D. rapaloides kameyamai* (SUGIYAMA) from the mainland. On the other hand, both subspecies possess smaller normal aedoeagus cornuti than in *D. rapaloides pseudorapaloides* WANG & CHOU. All these three taxa are treated here as conspecific because they share all of the important genital characters. The size of the normal cornutus and that of the first cornutus seems to have no value in taxonomy of the *Deudorix reperculsa* (LEECH) group, as they are individually variable within most of the other species. Moreover, the allopatric *D. rapaloides kameyamai* (SUGIYAMA) and *D. rapaloides pseudorapaloides* WANG & CHOU **stat. nov.** are hardly distinguishable from each other in ♀♀.

**Distribution:** Taiwan.

*Deudorix rapaloides pseudorapaloides* WANG & CHOU **stat. nov.** (Figs. 36-38, 69-70, 77-79)

*Rapala scintilla*, CHOU et. al., 1994: 655, figs. for ♂ from Guangdong. Misidentification.

*Deudorix pseudorapaloides* WANG & CHOU, 1996, Ent. Sinica 4 (3): 231, figs. 1A-1B for HT ♂, figs. 1C-1G for ♂ genitalia; TL: Huaping Nature Reserve (WANG, pers. comm.), Longsheng, Guangxi; WANG & FAN, 2002: 200, partim on fig. 96 for ♂ genitalia.

? *Deudorix rapaloides*, GU & CHEN, 1997: 270, figs. 357- ♀ (actually ♂) from Hainan.

*Deudorix nanlingensis* WANG & FAN, 2002: cp. 14, figs. 23-24 for HT ♂, 200-201, description, fig. 97 for ♂ genitalia; TL: Nanling Nature Reserve, Ruyuan, Guangdong. **Syn. nov.**

*Rapala varuna*, WANG et. al., 2012: pl. 100, figs. 17-19 for ♂♂ from Maoershan, Guangxi. Misidentification.

**Material:** Fujian Province: 2 ♂♂ (CHH), Longyan City, Shanghang, Guihe, Meihuashan Nature Reserve, 1300 m, 2.-6. VI.2007, H. HUANG leg.; Guangxi Province: 1 ♀ (CZJQ), Guilin City, Lingui, Huaping Nature Reserve, Anjiangping station, 1560 m, 14.VII.2011, J.-Q. ZHU leg.

**Identification:** This taxon was originally described on 1 ♂ specimen from Huaping, northern Guangxi, with the black and white photos of the HT and the hand drawing of the ♂ genitalia published. The material from Guangxi is very scanty in the collections and the further material known to the authors includes the color photos of 2 ♂♂ specimens from Maoershan, northern Guangxi published by WANG et. al. (2012) and a ♀ specimen from the TL examined. A ♂ specimen (fig. 37) from Meihuashan, southern Fujian agrees with the HT in most of the details of the wing characters and the fully developed carinae aedoeagi. All 2 ♂♂ (figs. 37-38) from southern Fujian share characters A-3, B-1, C-1, D-2, E-1, F-2, G-2, and H-1 (see under the species boundary and useful characters heading) with the HT; they have the wider carinae aedoeagi than those of *D. rapaloides kameyamai* (SUGIYAMA) from the more northern area. Further on, all these ♂♂ from southern Fujian and northern Guangxi have the darker and duller ground color on the wings upperside than in *D. rapaloides kameyamai* (SUGIYAMA). *Deudorix rapaloides pseudorapaloides* WANG & CHOU **stat. nov.** seems to be restricted to northern Guangxi, northern Guangdong and southern Fujian, and is replaced by *D.*

*rapaloides kameyamai* (SUGIYAMA) in the more northern area. The topotypic ♀ of *D. rapaloides pseudorapaloides* WANG & CHOU (Fig. 36) shows no difference from the ♀♀ of *D. rapaloides kameyamai* (SUGIYAMA) (figs. 35, 40, 42, 44-45).

**Specific characters:** As in the nominotypical subspecies from Taiwan, this taxon possesses characters A-3, B-1, C-1, D-2, E-1, F-2, G-2, and H-1 (see under the species boundary and useful characters heading).

**Subspecific characters:** This subspecies can be distinguished from the nominotypical one by the following combination of characters: 1) discal band on forewing underside in both sexes not contracted towards the dorsum of the forewing; 2) normal cornuti and first cornutus markedly larger. This subspecies can be distinguished from *D. rapaloides kameyamai* (SUGIYAMA) by the following combination of characters: 1) ground color on both wings upperside of ♂ darker and duller; 2) carinae aedoeagi larger; 3) normal cornuti and first cornutus markedly larger.

**Remarks:** In describing *Deudorix nanlingensis* WANG & FAN, 2002 as new, these authors misidentified the specimens of *D. sankakuhonis hainana* CHOU & GU as *D. pseudorapaloides* WANG & CHOU. They noticed that the valvae of *D. nanlingensis* WANG & FAN have the “fused basal portion much longer” than in *D. pseudorapaloides* WANG & CHOU so that they employed this character as the sole diagnostic character to separate the two taxa as different species. However, the length of the fused basal portion of valvae and the length of the distal branches of valvae are individually variable within most species of the *Deudorix reperculsa* (LEECH) group; none of them can be used as a diagnostic character to separate species. For instance, the 2 ♂♂ of *D. rapaloides pseudorapaloides* WANG & CHOU from the same locality of Meihuashan, Fujian (figs. 69-70) show considerable individual variation in this character. On the other hand, both HTs of *D. nanlingensis* WANG & FAN and *D. rapaloides pseudorapaloides* WANG & CHOU share characters A-3, B-1, C-1, D-2, E-1, F-2, G-2, and H-1 (see under the species boundary and useful characters heading). Moreover, the TL of *D. nanlingensis* WANG & FAN is situated between the TL of *D. rapaloides pseudorapaloides* WANG & CHOU and the Mt. Meihuashan, southern Fujian where the specimens of *D. rapaloides pseudorapaloides* WANG & CHOU have been collected. All these suggest that these two taxa are synonymous with each other.

**Distribution:** N. Guangxi, N. Guangdong, S. Fujian, Hainan (?).

*Deudorix rapaloides kameyamai* (SUGIYAMA, 2015) **comb. nov.** (figs. 31-35, 39-45, 66-68, 75-76)

*Deudorix rapaloides*: TONG, QIAN & WANG, 1993: 59, pl. 55, figs. 554-555 for ♀, figs. 556-557 for ♂; CHOU et. al., 1994: 651, figs. for ♂ and ♀ from Zhejiang; JIANG et. al., 2001: 115, pl. 121, figs. 26-374 for ♂ and ♀ from Sanming and Shunchang, central Fujian.

*Rapala rapaloides kameyamai* SUGIYAMA, 2015, *Pallarge* 9: 39-40, pl. 4, figs. 12, 13, 27, 28 for ♂ and ♀; TL: Wuling Mts., Hunan.

**Material:** Zhejiang Province: 3 ♂♂ (CZJQ), Lin-an City, West Tianmushan, 300-500 m, 30.V.2010, J.-Q. ZHU leg.; 1 ♀ (CZJQ), Lin-an, West Tianmushan, 400 m, 3.VI.2010, J.-Q. ZHU leg.; 1 ♀ (CZJQ), Lin-an, West Tianmushan, 430-600 m, 7.VI.2011, J.-Q. ZHU leg.; 1 ♂ (CZJQ), Lin-an, West Tianmushan, 350 m, 5.VI.2008, J.-Q. ZHU leg.; 1 ♂, 1 ♀ (CZJQ), Lin-an, West Tianmushan, 250-350 m, 19.VIII.2006, J.-Q. ZHU leg.; 1 ♂ (CZJQ), Lin-an, Qingliangfeng, 900 m, 13.VI.2014, J.-Q. ZHU leg.; 1 ♂ (CZJQ), Ningpo City, Fenghua, Xuedoushan [Snow valley], 400 m, 30.IX.2010, J.-Q. ZHU leg.; 1 ♂ (CZJQ), Lin-an, West Tianmushan, no further data; 1 ♀ (CZJQ), Taishun County, Wuyanling, 1.VIII.2005, Y. LIU leg.; 1 ♂ (CZJQ), Lishui City, Qingyuan, Baishanzu Nature Reserve, 1150 m, 23.VII.2007, J.-Q. ZHU leg.; Jiangxi Province: 1 ♀ (CZJQ), Shangrao City, Sanqingshan, Fenshui, 400 m, 11.X.2010, J.-Q. ZHU leg.; Anhui Province: 2 ♂♂ (CLZH), Huangshan City, Fuxi, V. & VIII.2013, Z.-H. LIU leg.; 1 ♀ (CHH), Huangshan City, Shitai, Guniujiang Nature Reserve, 800 m, 20.VIII.2011, H. HUANG leg.; Shaanxi Province: 1 ♂ (CLYF), Ankang City, Zhenping County, 1500 m, VII.2014, Y.-F. LI leg.

**Identification:** This taxon was described to be different from *D. rapaloides rapaloides* (NARITOMI) by having the blue coloring on both wings upperside more extensive and lighter, and the discal band on forewing underside not contracted towards the dorsum of the forewing. The ♂♂ examined agree with this description and the original figures.

**Specific characters:** As in the foregoing two subspecies, this taxon possesses characters A-3, B-1, C-1, D-2, E-1, F-2, G-2, and H-1 (see under the species boundary and useful characters heading).

**Subspecific characters:** This subspecies can be distinguished from the nominotypical one by the following combination of characters: 1) blue coloring on both wings upperside in ♂ lighter and more extensive; 2) ground color of both wings underside in ♂ usually more reddish and less grayish; 3) forewing underside discal band in both sexes nearly even in width throughout, not contracted towards dorsum of forewing. The subspecies can be distinguished from *D. r. pseudorapaloides* WANG & CHOU from Guangxi, Guangdong and southern Fujian by the following combination of ♂ characters: 1) blue coloring on both wings upperside lighter and more extensive; 2) ground color of both wings underside usually more reddish and paler; 3) normal cornuti aedoeagi smaller. However, there is no difference in wing characters between the ♀♀ of *D. r. kameyamai* SUGIYAMA **comb. nov.** and *D. r. pseudorapaloides* WANG & CHOU.

**Remarks:** There is considerable individual variation in length of tail and size of wings within the population from Zhejiang. The collecting data show that this subspecies has two generations at least, one in May-June, and one in

August-October.

**Distribution:** Hunan, Zhejiang, N. Fujian, Jiangxi, Anhui, Shaanxi.

*Deudorix dengi* H. HUANG, ZHU & LI **spec. nov.** (figs. 27-30, 71-74)

HT ♂ (fig. 27, BSNU): Chongqing, Jiangjin County, Simianshan Nature Reserve, Chaqishan, 1500-2000 m, 24.VII.2009, A.-M. LI leg..

PTs: Chongqing: 1 ♂ (CZJQ), same data as HT. Guangxi Province: 1 ♀ (Fig. 30, CZJQ), Jinxiu County, Dayaoshan Nature Reserve, Mt. Shengtangshan, 1230-1910 m, 25.VII.2011, J.-Q. ZHU leg.; Fujian Province: 1 ♂ (fig. 28, CHH), Wuyishan Nature Reserve, Guadun village, 1100 m, 11.VII.2009, H. HUANG leg.; Zhejiang Province: 1 ♂ (fig. 29, CZJQ), Lishui City, Qingyuan, Baishanzu Nature Reserve, 1150 m, 22.VII.2007, J.-Q. ZHU leg.

**Diagnosis:** This new species possesses characters A-2, B-1, C-1, D-2, E-1, F-1, G-1, and H-1 (see under the species boundary and useful characters heading). It is more similar to *D. rapaloides* (NARITOMI) than to other species, but *D. dengi spec. nov.* can be distinguished from *D. rapaloides* (NARITOMI) by the following combination of characters: 1) forewing upperside in both sexes extensively dusted by whitish blue scales which are entirely absent in *D. rapaloides* (NARITOMI); 2) whitish patch in space 6 distal to ♂ brand on hindwing upperside markedly larger; 3) valvae of ♂ genitalia in ventral view with their widest point nearly at middle (character F-1); 4) distal branch of valvae nearly as long as ampulla (character G-1).

**Remarks:** The association of ♂♂ and ♀♀ in this work needs to be confirmed by more material. The populations from Zhejiang and Fujian have the larger size of wings, the less marked pale blue scales on forewing upperside and the wider discal bands on both wings underside than in the population from Chongqing; they may represent a distinct subspecies. Such geographical variation is different from that of *D. rapaloides* (NARITOMI), supporting *D. dengi spec. nov.* to be a separate species from *D. rapaloides* (NARITOMI).

**Etymology:** This new species is named in honor of Mr. HE-LI DENG, Chongqing Museum of Natural History.

**Distribution:** Chongqing, Guangxi, Zhejiang, Fujian.

**Notes on taxa from outside China**

- 1) *Virachola superbiens* SAITO & SEKI, 2006 from northern Vietnam falls into the geographical variations of *D. rapaloides* (NARITOMI). All of the characters employed by SAITO & SEKI (2006) have no importance in specific classification of the *Deudorix reperculsa* (LEECH) group; they are variable (individually or geographically) within *D. rapaloides* (NARITOMI), including the appearance of the discocellular bars on the wings underside, the ground color on the wings underside, the length of the tail, the anal lobe of the hindwing, and the detailed shape of the male brand on the hindwing upperside. In ♂ genitalia, *V. superbiens* SAITO & SEKI has the „tip of valva straight and tips of both valvae coming close to each other in the normal condition, while it is warped outside in *rapaloides*“. However, such observations may not reflect the true difference in ♂ genitalia, as the lateral sides of valvae in the *D. reperculsa* (LEECH) group are very twistable so that the width, the lateral margins and the detailed shape of the distal branches of the valvae can be very variable. For example, the valvae of *D. r. rapaloides* (NARITOMI) figured by the same authors (SAITO & SEKI, 2006) are markedly different from those illustrated by SHIRÔZU (1960), with a markedly smaller width-length ratio of the valvae and the straighter lateral margins of the valvae. On the other hand, *V. superbiens* SAITO & SEKI possesses characters A-3, B-1, C-1, D-2, E-1, F-2, G-2, and H-1 (see under the species boundary and useful characters heading) as well as all the known subspecies of *D. rapaloides* (NARITOMI).
- 2) *Rapala refulgens* NICÉVILLE seems to be restricted to northeastern India and northern Myanmar. The record from Laos (SAITO & SEKI, 2006) is a misidentification of a new population of *D. rapaloides* (NARITOMI). According to the original description (NICÉVILLE, 1891) and D'ABRERA'S (1986: 628) color photos of the specimens kept in BMNH, the ♂ of *R. refulgens* NICÉVILLE has a markedly brighter blue suffusion on both wings upperside and a blunter apex of forewing than in the ♂ specimen studied by SEKI & SAITO (2006: figs. 22, 38) from Laos. SEKI & SAITO'S (2006) specimen from Laos possesses characters A-3, B-1, C-1, D-2, E-1, F-2, G-2, and H-1 (see under the species boundary and useful characters heading) as well as all the known subspecies of *D. rapaloides* (NARITOMI). It is noticeable that the ♂ from Laos is markedly smaller than that from Vietnam in the same plate (SEKI & SAITO, 2006), however it is read that the ♂ from Laos was collected from March whilst that of Vietnam from July. A further study on more material is required.
- 3) *Virachola dohertyi* TYTLER is restricted to northeastern India and northern Myanmar as well. It is distinguishable from all other species of the *D. reperculsa* (LEECH) group by having an extensive whitish blue suffusion on hindwing upperside almost reaching the termen of hindwing.

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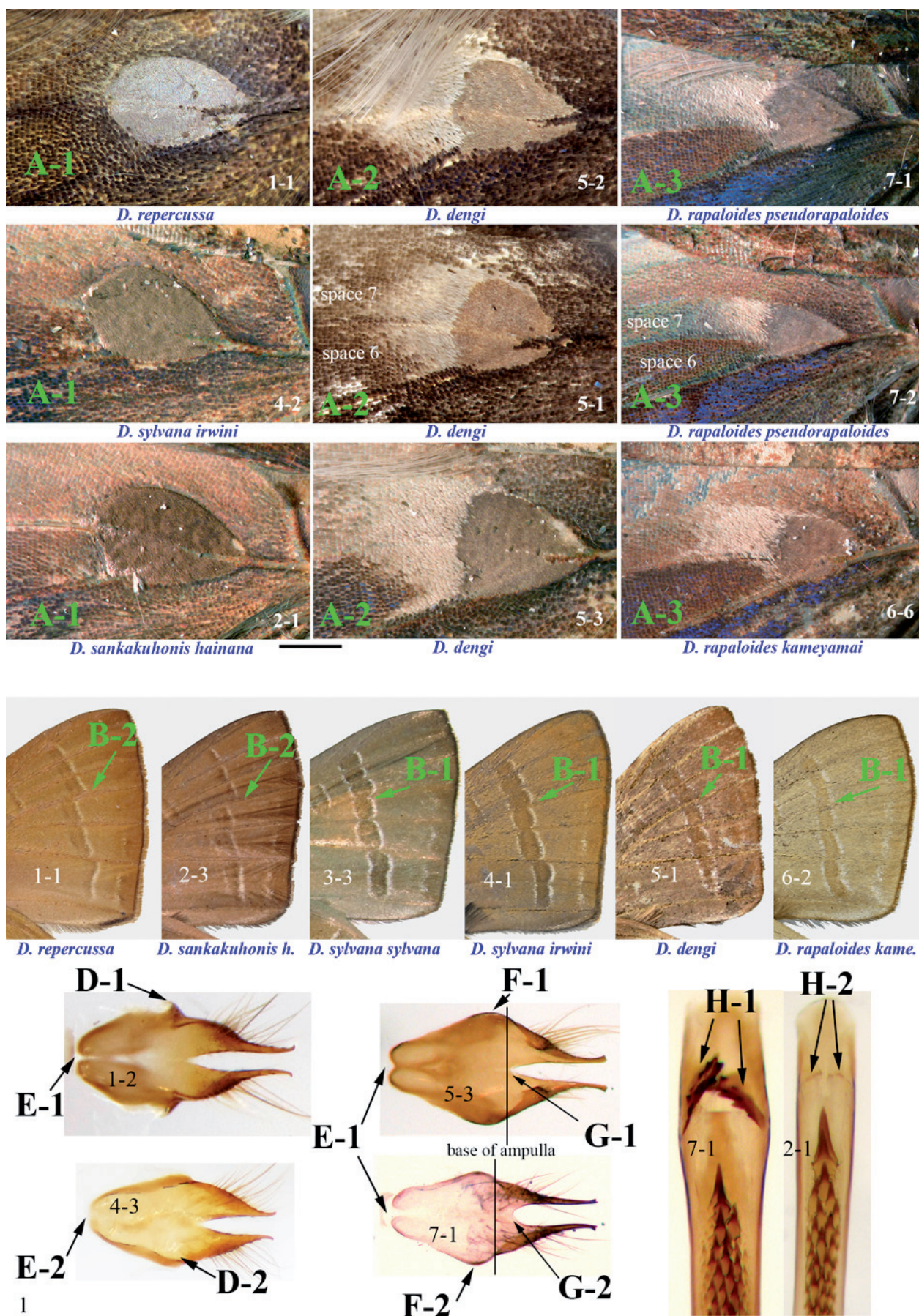


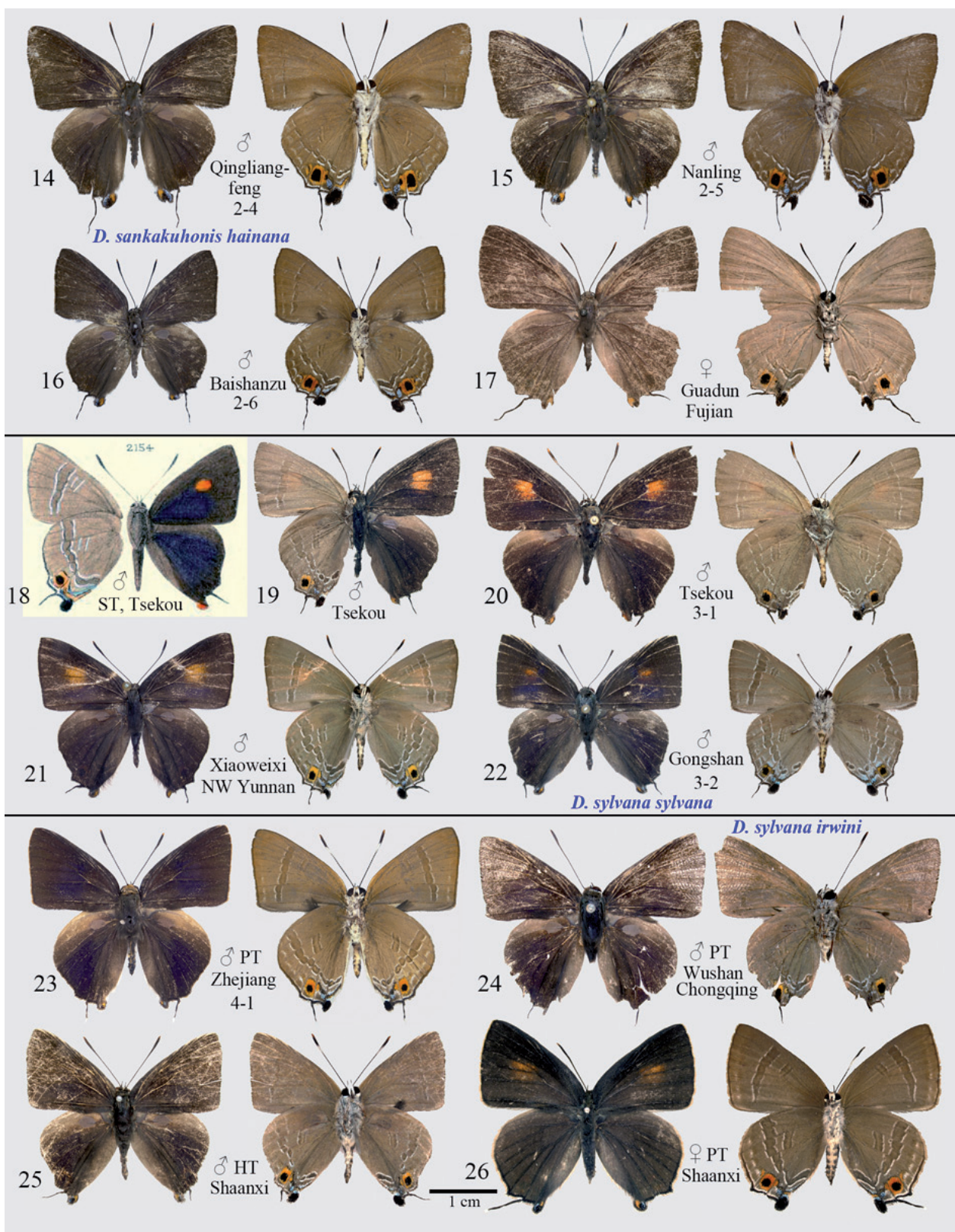
Fig. 1: Important characters mentioned in text under the species boundary and useful characters heading. The code in combination of uppercase letter and number (such as A-1) representing the character state mentioned in text. The code in combination of two numbers (such as 1-1) representing the specimen ID.





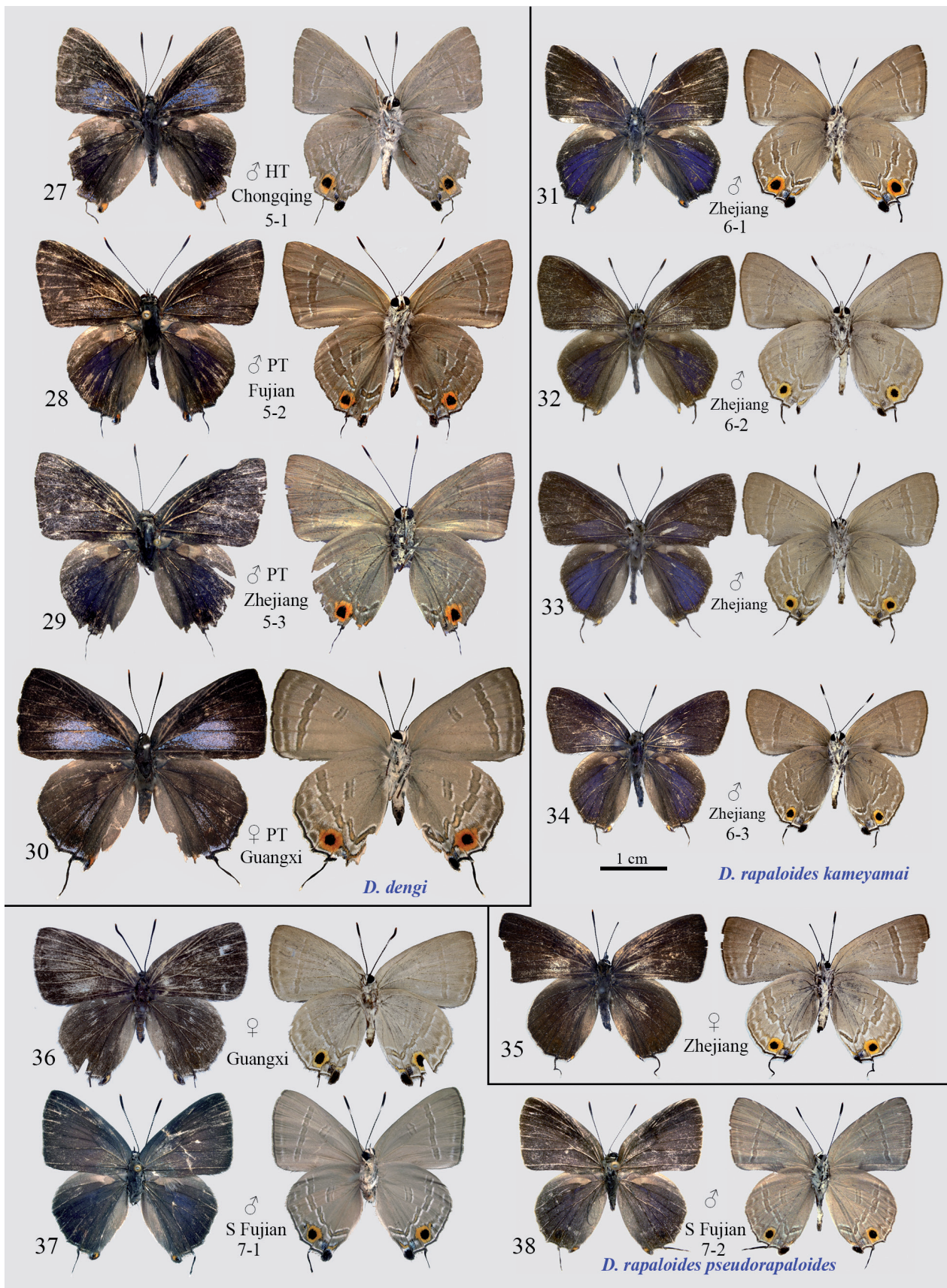
Figs. 2-13: Habitus of *Deudorix* taxa under same scale, upperside (left) and underside (right). Each of the specimens dissected are labelled with a unique specimen ID. (2-7) *D. reperculsa* (LEECH); (8-13) *D. sankakuhonis hainana* CHOU & GU.





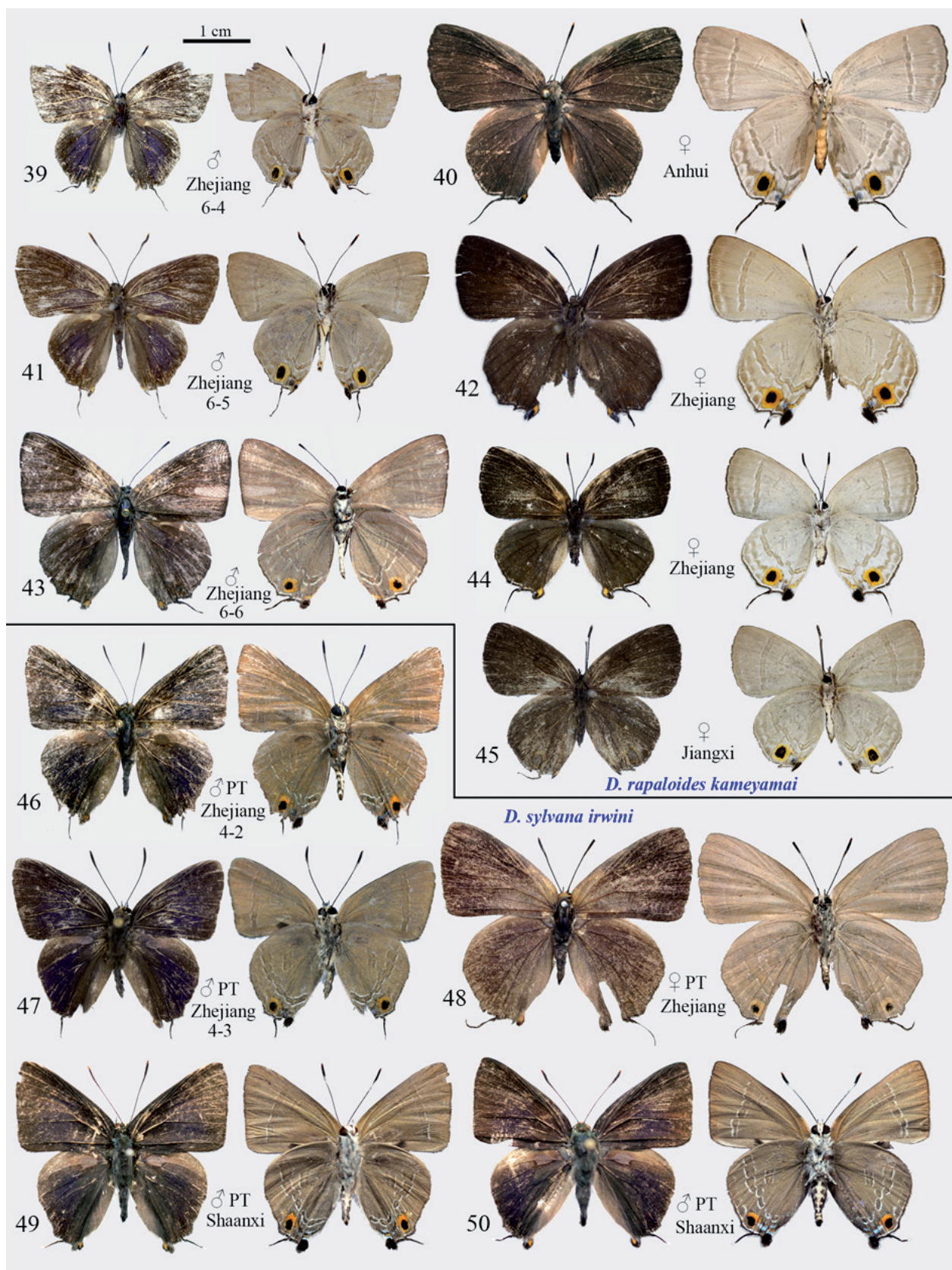
Figs. 14-26: Habitus of *Deudorix* taxa under same scale, upperside (left, except for 18-19) and underside (right, except for 18-19). (18-19) underside (left half) and upperside (right half). (14-17) *D. sankakuhonis hainana* CHOU & GU; (18-22) *D. sylvana sylvana* OBERTHÜR; (23-26) *D. sylvana irwini* H. HUANG & ZHU **subspec. nov.**





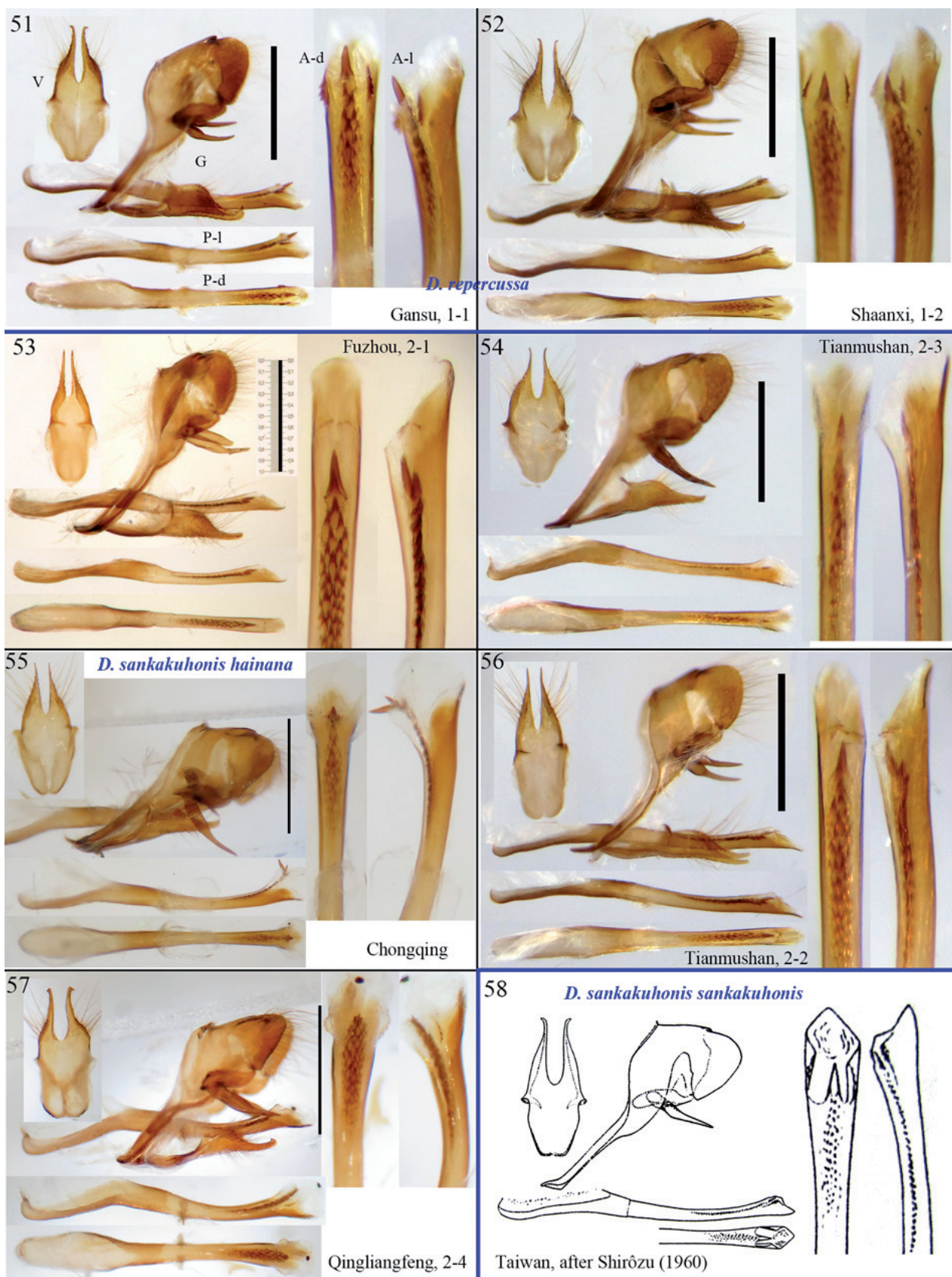
Figs. 27-38: Habitus of *Deudorix* taxa under same scale, upperside (left) and underside (right). (27-30) *D. dengi* H. HUANG, ZHU & LI spec. nov.; (31-35) *D. rapaloides kameyamai* (SUGIYAMA); (36-38) *D. rapaloides pseudorapaloides* WANG & CHOU.





Figs. 39-50: Habitus of *Deudorix* taxa under same scale, upperside (left) and underside (right). (39-45) *D. rapaloides kameyamai* (SUGIYAMA); (46-50) *D. sylvana irwini* H. HUANG & ZHU **subspec. nov.**





Figs. 51-58: ♂ genitalia of *Deudorix* taxa with structures in corresponding positions of figures, consisting of valvae in dorsal view (V), of whole genitalia in lateral view (G), of aedeagus in lateral view (P-l), of aedeagus in dorsal view (P-d), of enlarged apex of aedeagus in dorsal view (A-d), and of enlarged apex of phallus in lateral view (A-l). All scales = 1mm. Each of specimens with habitus figured labelled with a unique specimen ID. (51-52) *D. reperculsa* (LEECH); (53-57) *D. sankakuhonis hainana* CHOU & GU; (58) *D. sankakuhonis sankakuhonis* (MATSUMURA), reproduced from SHIRÔZU (1960).





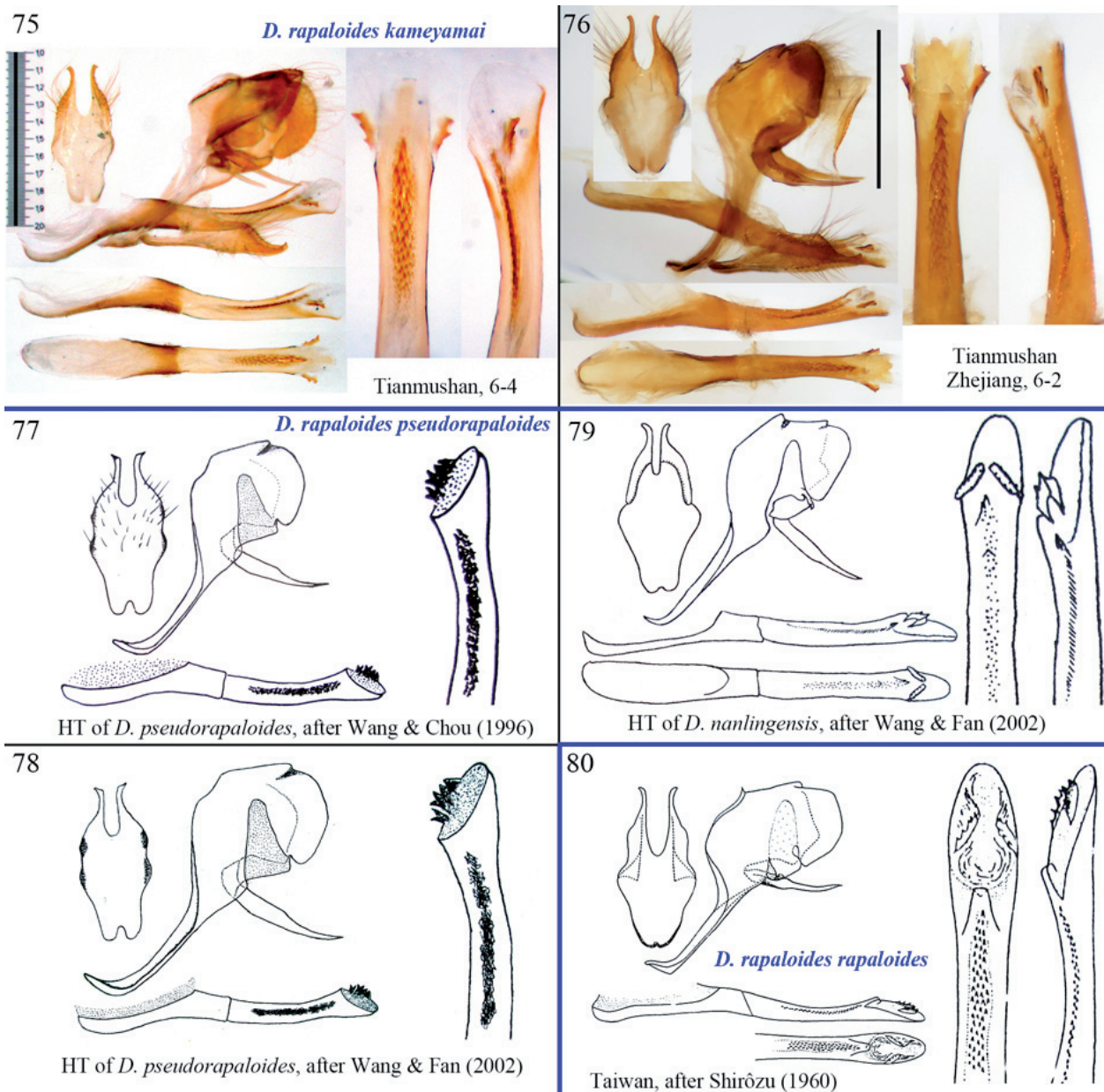
Figs. 59-66: ♂ genitalia of *Deudorix* taxa with structures in corresponding positions of figures. (59-60) *D. sankakuhonis hainana* CHOU & GU; (61-62) *D. sylvana sylvana* OBERTHÜR; (63-65) *D. sylvana irwini* H. HUANG & ZHU **subspec. nov.**; (66) *D. rapaloides kameyamai* (SUGIYAMA).





Figs. 67-74: ♂ genitalia of *Deudorix* taxa with structures in corresponding positions of figures. (67-68) *D. rapaloides kameyamai* (SUGIYAMA); (69-70) *D. rapaloides pseudorapaloides* WANG & CHOU; (71-74) *D. dengi* H. HUANG, ZHU & LI spec. nov.





Figs. 75-80: ♂ genitalia of *Deudorix* taxa with structures in corresponding positions of figures. (75-76) *D. rapaloides kameyamai* (SUGIYAMA); (77-79) *D. rapaloides pseudorapaloides* WANG & CHOU, reproduced from literature; (80) *D. rapaloides rapaloides* (NARITOMI), reproduced from SHIRÔZU (1960).